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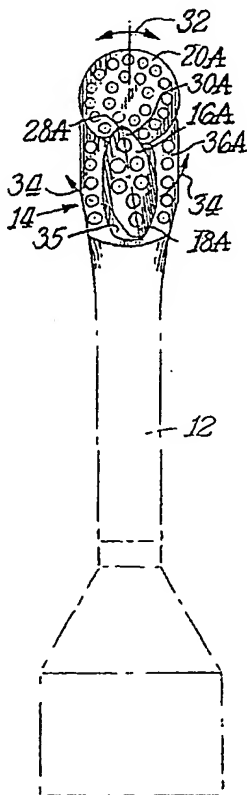
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(54) Title: **POWERED TOOTHBRUSH**



(57) Abstract: A toothbrush head containing a first tuft block mounted for oscillating about a centrally located axis and an elongated second tuft block mounted for rotational movement about an axis eccentric to its center point. One of the tuft blocks has a recess for receiving an extension of the other tuft block to create a drive connection between the two tuft blocks, such that when one of the tuft blocks is driven by a drive structure the rotational movement of that tuft block causes the other tuft block to oscillate.

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POWERED TOOTHBRUSH

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Background of the Invention

The present invention is directed to a powered toothbrush head that includes an oscillating block having bristles extending therefrom. Various types of such powered toothbrushes are generally known in the art which provide for cleaning and massaging of both the soft and hard tissue of the mouth. Reference is made to U.S. Patent No. 5,625,916 which relates to an electrically driven toothbrush which includes a motor drive for rotating a drive shaft. The drive shaft is connected to a bristle holder on the head of the toothbrush in such a manner that rotation of the drive shaft causes the bristle holder to rotationally oscillate back and forth. Various other arrangements are known for oscillating a bristle holder mounted to the head of an electric toothbrush.

U.S. Patent No. 5,416,942 describes a motorized toothbrush having two concentrically arranged brushes coaxially supported in a shell. The brushes are driven by a drive shaft connected to a spindle which is bent to form two inclined arms at its end. Each of the arms is located in a slot in each respective brush. When the drive shaft is rotated the inclined arms cause each brush to rotate about their axis in opposite directions to each other.

The motorized toothbrush described in PCT International Publication No. WO 00/78244 similarly includes two coaxially mounted first and second brush heads which rotationally oscillate with respect to each other in different directions and/or at different speeds. Two different drive mechanisms are disclosed. One drive mechanism includes a linearly reciprocating actuator to which two connecting
5 rods are attached. The connecting rods are formed from a single piece of wire generally V—shaped with an end of each connecting rod being mounted to a different one of the brush heads. As the actuator and connecting rods are moved linearly back and forth the ends of the connecting rods are moved toward and away from each other to cause the brush heads to rotate. In the second embodiment each brush head is provided with a toothed region which engages a conical gear at the
10 distal end of a rotationally oscillating shaft so that rotational oscillation of the shaft is transmitted by the conical gear to each toothed region to thereby rotationally oscillate the brush heads.

U.S. Patent No. 5,836,030 discloses a rather complicated arrangement for a dental cleaning device having two brush holders. One of the brush holders is reciprocated about a pivotal axis as a result of a
15 pivotal coupling between the brush holder and a connecting rod in the drive means. The other brush holder is also reciprocated about a pivotal axis as a result of a coupling between the brush holder and a drive member of the drive means. Although the two brush holders are located adjacent to each other the reciprocation of one of the brush holders is not utilized to cause the reciprocation of the other brush holder. Instead, both brush holders oscillate as a result of each brush holder being coupled to
20 the drive means.

U.S. Patent No. 6,308,358 discloses a toothbrush having a bristle holder and an interdental bristle holder. The patent states that each of these bristle holders performs a pivotal movement along a circular path, but does not state how the bristle holders are driven.

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U.S. Patent No. 3,242,516 discloses a toothbrush having a central set of bristles with a further set of bristles on each side thereof. The central set is driven by a drive mechanism. The central set

includes a gear which meshes with gears for each of the other two sets so that rotation of the central set of brush elements will cause the other sets of brush elements to also rotate. No mention is made of rotating the brush elements back and forth in an oscillating manner.

5 U.S. Patent No. 5,353,460 discloses a power driven toothbrush which uses a rather complicated drive arrangement including various types of gears and modified shaft structure to rotationally oscillate a brush carrier. The brush carrier is linked to a brush holder so that the brush holder is also rotationally oscillated.

10 U.S. Patent No. 5,504,959 discloses an electric toothbrush wherein a pair of rotating bases holding brush bundles is rotatably mounted in a pair of pins secured to a slider. A pinion is secured to each base for engagement with a rack of a holder. The slider is mounted in the holder and moved longitudinally by a drive mechanism. As the slider moves longitudinally the engagement of the pinions with the rack causes the bases to rotate in a reciprocating motion to thereby reciprocatingly
15 rotate the brush bundles.

There is a need in the art of an electric toothbrush which provides a combination of motions to best clean and massage the oral tissues, especially a wiping motion along the facial and lingual surfaces of the teeth not disclosed in the prior art, which wiping motion provides for enhanced
20 removal any trapped matter in the interproximal spaces between the teeth.

Summary of the Invention

An object of this invention is to provide a powered toothbrush head which is capable of delivering
25 a combination of motions, including a wiping motion to provide enhanced cleaning especially in the interproximal spaces between the teeth, in addition to the normal cleaning, whitening and massaging action of a typical powered toothbrush product.

In accordance with this invention the toothbrush head has mounted thereon a first tuft block which has an outer surface, i.e. facial cross-section, that is generally circular or egg-shaped . This first tuft block is mounted in such a manner as to oscillate back and forth preferably rotationally. The head
5 includes a second tuft block which has a drive connection with the first tuft block so that both tuft blocks are oscillated from a single drive. This second tuft block has an elongated shape and pivots about an eccentric or non-centrally located axis to function in the manner of a wiper.

The invention may be practiced where other portions of the head include bristles which could be
10 fixed bristles or could be movable bristles such as by being mounted on elastomeric base for independent movement.

If desired, additional tuft blocks could be mounted on the head which are also movable such as by moving longitudinally with regard to the longitudinal axis of the head or movable laterally or movable
15 rotationally or movable in and out in a direction generally perpendicular to the outer surface of the head.

The elongated second tuft block may have an elongated outer surface or front cross-section which is oval, triangular, diamond shape, polygonal or rectangular and which is mounted on an off-center
20 pivot, preferably adjacent to its end opposite the first generally circular or egg-shaped tuft block. One of said tuft blocks includes a cut-out into which an extension or end of the other tuft block is mounted thereby creating a drive connection. Thus, rotation of one tuft block results in rotation of the other tuft block, with the circular tuft block rotating about its central axis, while the elongated tuft block swings in a wiping type motion with both tuft blocks oscillating back and forth. A shaft connected to
25 a motor could directly drive either tuft block, with the drive connection oscillating the other tuft block.

The Drawings:

Figure 1 is a perspective view of a toothbrush head in accordance with this invention;

5 Figure 2 is a front elevational view of the head shown in Figure 1;

Figure 3 is a side elevational view of the head shown in Figures 1-2;

Figure 4 is a top plan view of the head shown in Figures 1-3;

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Figure 5 is a perspective view of a toothbrush head in accordance with a further embodiment of this invention;

Figure 6 is a front elevational view of the head shown in Figure 5;

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Figure 7 is a side elevational view of the head shown in Figures 5-6; and

Figure 8 is a top plan view of the head shown in Figures 5-7.

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Detailed Description

Figures 1-4 illustrate one practice of this invention wherein a toothbrush 10 includes a neck section 12 of a handle 13 and a head 14. The head 14/neck 12 may be replaceable, i.e. a refill head or
25 the head 14/neck 12 section may be permanently attached to the handle 13 within the practice of this invention.

As illustrated, particularly in Figure 2, the head 14 includes an elongated tuft block 16 which is illustrated as being at the outermost or distal portion of head 14. Tuft block 16 is preferably a disk of generally elongated shape, with an outer surface that is oval; however, it may be in an elongated triangle, diamond, polygon or a thin rectangle shape. Tuft block 16 is mounted for rotation on a pin
5 located at one end of the tuft block to oscillate about a pivot axis 18. The pivot axis 18 is thus off-center or eccentric.

As also illustrated in Figure 2 a second tuft block 20 is mounted on head 14. Tuft block 20 is preferably a generally circular type disk which is mounted on a pin for rotation about a centrally
10 located axis parallel to axis 18. Tuft block 20 is mounted for oscillating rotation back and forth in a plane generally parallel to the outer surface 22 of head 14. Any suitable drive structure could be used for oscillating tuft block 20. For example, Figure 3 illustrates the type of drive structure disclosed in U.S. Patent No. 5,625,916, all of the details of which are incorporated herein by reference thereto. As shown therein the toothbrush 10 includes a drive shaft 24 which is driven from a motor (not shown) in
15 handle 13. Drive shaft 24 terminates in a bent drive end 26 located in a slot in tuft block 20. As shaft 24 is rotated the uni-directional rotation of shaft 24 and its drive end 26 are transmitted to tuft block 20 as a reciprocating rotational motion indicated by the arrow 32.

As best seen in Figure 2 tuft block 20 includes a cut-out or recess 28 into which an extension of
20 the end 30 of tuft block 16 may be mounted. End 30 is thus an engaging member to assure moving contact between the tuft blocks 16,20. As a result of this engagement a drive connection is made between tuft block 20 and tuft block 16 so that the oscillation of tuft block 20 which is shown by the arrow 32 is transmitted to elongated tuft block 16. Because, however, tuft block 16 is pivoted eccentrically at its end remote from tuft block 20, the oscillating movement shown by arrow 32 results
25 in a wiper type swinging of tuft block 16 as shown by arrows 34,34. The movement of tuft block 16 occurs in recess 35 of head 14. The wiping movement is advantageous since it corresponds to a toothbrush head being moved up and down the facial and lingual surfaces of the teeth, which is the

recommended manner of brushing to enhance cleaning of the interproximal spaces between the teeth. The wiping movement is enhanced by the elongated shape of tuft block 16.

As also shown in Figures 1 and 2 the head 14 includes a third section 36 which is of generally U-shape and extends around first section or tuft block 16. The third section 36 may be provided with a plurality of tufts of bristles 38. Similarly, as illustrated tuft block 16 includes a plurality of sets of bristles 40. Tuft block 20 has an outer arcuate row of bristles 42 and an inner arcuate row of bristles 44.

While Figures 1-4 illustrate the various bristles to be of conventional fiber form, the term "bristles" is intended to be used in a generic sense as cleaning elements or massage elements and could include, for example, elastomeric fingers or walls arranged in a circular cross-section shape or any type of desired shape or cross-section, including straight portions or sinusoidal portions.

It is to be understood that the specific illustration of the bristles is merely for exemplary purposes. The invention can, however, be practiced with various combinations of the same or different bristle configurations embedded in the brush head 14 by known technology, such as stapled technology or in-mold tufting technology using the same or different bristle materials (such as nylon bristles, spiral bristles, rubber bristles, etc.). Similarly, while Figures 1-4 illustrate the bristles to be generally perpendicular to the outer surface 22 of head 14, some or all of the bristles may be angled at various angles with respect to the outer surface of the bristle head. It is thereby possible to select the combination of bristle configurations, bristle materials and bristle orientations to achieve specific intended results, such as to create as much movement from the oscillating tuft heads to deliver additional oral health benefits like enhanced cleaning, tooth polishing, tooth whitening and/or massaging of the gums.

Although all of the bristles may be of the same length so that a planar brushing surface results

from the various sections of head 14, the bristles could be of differing lengths. For example, the inner row of bristles 44 could be shorter than the outer row of bristles 42 on tuft block 20 so that a cup-like effect is produced which would help retain the toothpaste on the tuft block. Similarly, the bristles 40 could be shorter than the bristles 38 to also create a cup-like structure.

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The amplitude of wiping action of tuft block 16 could be such in combination with the location of bristles 38 on section 36 that the swinging tuft block 16 impacts against the bristles 38 to cause the bristles 38 to move outwardly, particularly where the bristles are mounted on an elastomeric base. Tuft block 16 may, for example, include an outward flange located above its bristles carrying surface and extending outwardly from its periphery so as to act as a contact member for contacting the bristles 38. Bristles 38 could be in the form of rubber fingers which may or need not be contacted by wiping tuft block 16.

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Figures 5-8 illustrate an alternative embodiment of the invention wherein the sections on head 14 are reversed from that shown in Figures 1-4. Thus, as shown in Figures 5-8 the rotationally oscillating head 20A is located at the distal-most portion of head 14. The wiping elongated tuft block 16A would be located adjacent to the neck 12. Tuft block 16A would be oscillated by shaft end 26 to pivot about its pivot axis 18A. The opposite end 30A of tuft block 16A would be engaged in recess 28A of tuft block 20A so that the oscillating movement of tuft block 16A as shown by the arrows 34,34 would be transmitted as a rotational oscillating movement of tuft block 20A as shown by the arrow 32. A third section 36A would also be provided around tuft block 16A.

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The outer surfaces of each of the sections of head 14 are coplanar so that the outer surface 22 of head 14 may be in a single plane. The invention may be practiced, however, where one or more sections may be in a parallel plane or even an inclined plane particularly the fixed section 36 or 36A may be inclined as compared to the orientation of the other sections.

25

In the preferred practice of the invention the drive connection between the circular tuft block 20 and the elongated tuft block 16 results from a recess 28 in tuft block 20 which receives the projection or end 30 of tuft block 16. The invention, however, may also be practiced where the end 30 of tuft block 16 has a recess and tuft block 20 has an extension which fits into the recess. The drive connection may also be a link pivotally connected to each tuft block. Any suitable structure may be used which transmits an oscillating movement of one tuft block into an oscillating movement of the other tuft block.

Preferably, the invention is practiced where the third section 36 or 36A is a non-moving, fixed section either having stationary or fixed bristles or bristles which can move independently of each other by being mounted in an elastomeric base. The invention, however, may also be practiced where the third section 36 or 36A is also movable. For example, the third section may move in and out in a direction generally perpendicular to the outer surface 22 of head 14. This would result in a vibrating section. Any suitable drive mechanism may be used to accomplish this in and out vibrating motion such as the type of drive mechanism described in U.S. Patent No. Re.35,941, all of the details of which are incorporated herein by reference thereto. Alternatively the vibrating section could be free floating without a positive drive. Other forms of movement of third section 36 or 36A could be where the movement is longitudinal with respect to the longitudinal axis of head 14 or could be a lateral movement. Any suitable drive mechanism may be used to accomplish these motions which would be in a plane generally parallel to the outer surface 22 of head 14. Reference is made to co-pending parent application Serial No. 10/066,459, filed January 31, 2002, all of the details of which are incorporated herein by reference thereto.

Although the drawings illustrate the two oscillating tuft blocks to comprise one tuft block which is generally circular in form and which rotates about its central axis and the other tuft block to be elongated and which rotates about an eccentric axis, other variations may be used within the practice of the invention. For example, both tuft blocks could be of generally circular shape and a form of

wiping action would still be achieved if one of the tuft blocks is eccentrically mounted. Similarly, both tuft blocks could be eccentrically mounted so that a double wiping affect is achieved. Where an elongated tuft block is used the tuft block can have a shape other than an oval shape and preferably includes some structure to interact with structure on the other tuft block so as to form a drive
5 connection.

The invention may also be practiced where both tuft blocks are of elongated shape with one tuft block being eccentrically mounted and the other tuft block mounted about its central axis.

10 While the drawings illustrate a third section to be disposed around the eccentrically mounted tuft block the invention may be practiced with a further section around the centrally mounted tuft block in addition to or instead of being located around the eccentrically pivoted tuft block.

What is claimed is:

1. A powered toothbrush having a handle with a neck, a head mounted to said neck, said head having an exposed outer surface; a first tuft block mounted to said head having
5 bristles extending outwardly therefrom; a second tuft block mounted to said head having bristles extending outwardly therefrom; said first tuft block mounted for oscillating rotation about a pivot axis, said second tuft block being mounted for oscillating rotation about an eccentric pivot axis; a drive connection between said first tuft block and said second tuft block; a drive structure for oscillating one of said first
10 tuft block and said second tuft block, with said drive connection causing the other of said first tuft block and said second tuft block to oscillate; and said oscillating movement of said eccentrically pivoted tuft block being oscillated in a wiping type movement.
- 15 2. The toothbrush of claim 1 wherein said head includes a section located generally peripherally around said eccentrically pivoted tuft block.
3. The toothbrush of claim 2 wherein a plurality of bristles extend outwardly from said section.
- 20 4. The toothbrush of claim 1 wherein said eccentrically pivoted tuft block has an elongated shape.
5. The toothbrush of claim 1 wherein said pivot axis of said first tuft block is a centrally
25 located axis.
6. The toothbrush of claim 1 wherein said first tuft block has an outer surface which is

generally circular or egg-shaped.

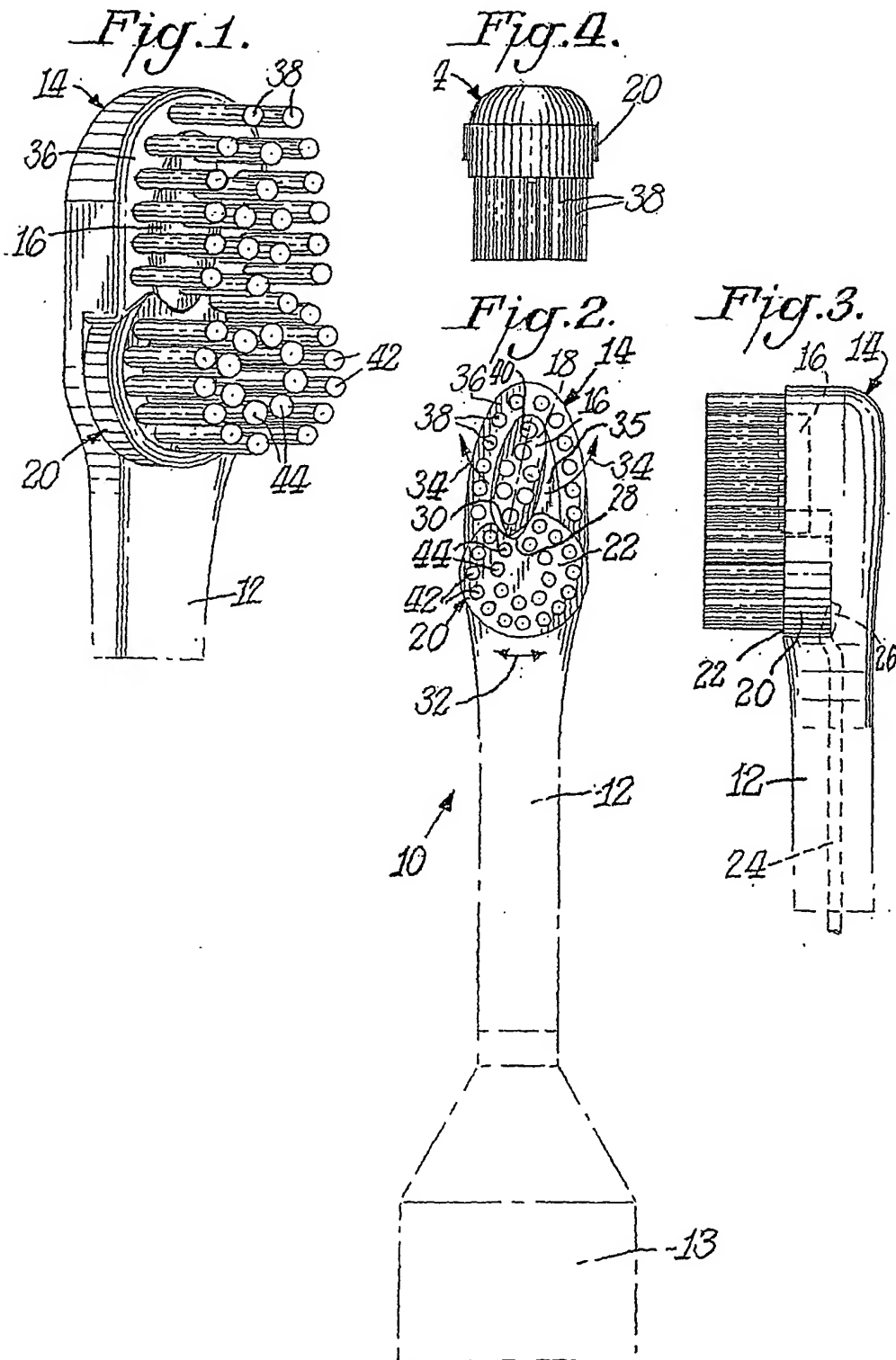
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7. The toothbrush of claim 1 wherein said drive connection includes a cut-out in the periphery of one of said tuft blocks, and the other of said tuft blocks having an engaging member located in said cut-out to maintain engagement between said tuft blocks during the movement of said tuft blocks.
- 10
8. The toothbrush of claim 7 wherein said engaging member is an end portion of said elongated tuft block, and said cut-out is in said first tuft block.
9. The toothbrush of claim 1 wherein said drive structure includes a motor operated drive member engaged with said first tuft block, whereby oscillation of said first tuft block causes said second tuft block to oscillate.
- 15
10. The toothbrush of claim 1 wherein said first tuft block is located on said head adjacent to said neck.
11. The toothbrush of claim 1 wherein said drive structure includes a motor operated drive member engaged with said second tuft block whereby oscillation of said second tuft
- 20
- block causes said first tuft block to oscillate.
12. The toothbrush of claim 1 wherein said second tuft block is located adjacent to said neck.
- 25
13. The toothbrush of claim 3 wherein said section is a fixed section.
14. The toothbrush of claim 13 wherein said bristles on said fixed section are fixed

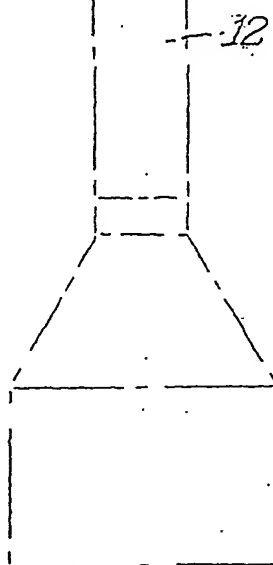
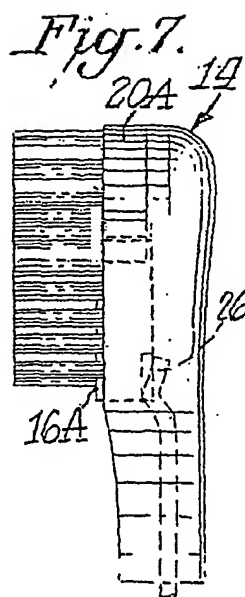
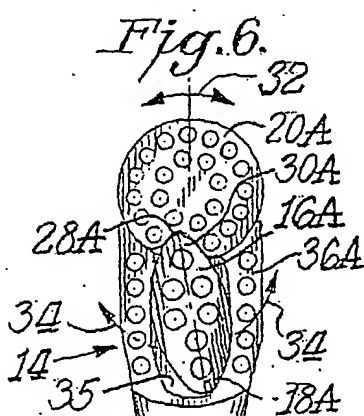
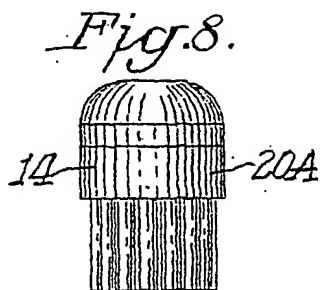
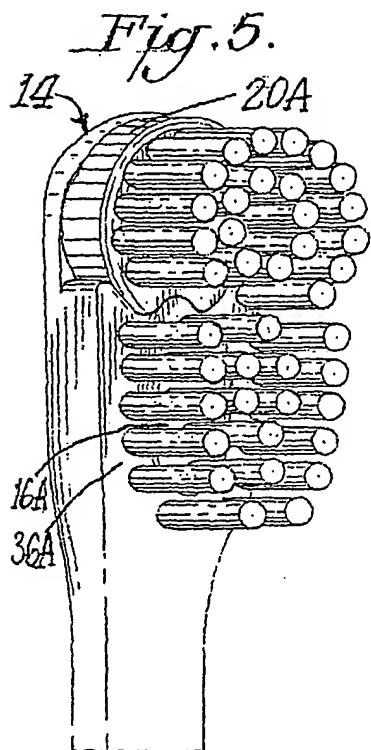
bristles.

15. The toothbrush of claim 13 wherein said bristles on said fixed section are mounted for independent movement with respect to each other.

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16. The toothbrush of claim 4 wherein said elongated shape has an outer surface which is oval, triangular, diamond shape, polygonal or rectangular.





INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61C17/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 259 648 A (BRAUN AG) 16 March 1988 (1988-03-16) the whole document	1
A	US 5 461 744 A (MERBACH LOTHAR) 31 October 1995 (1995-10-31) claim 1; figure 1	1
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☐ Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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